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EXAMINER	
PEACE, RHONDA S	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/759,511	Applicant(s) BRUESSELBACH ET AL.	
	Examiner Rhonda S. Peace	Art Unit 2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 10 APRIL 2006.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17 and 19-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17 and 19-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Russell et al (US Patent 4932747).

As to claim 1, Russell et al teaches a plurality of optical fibers **15** (column 3 lines 63-67, Figure 3), each having a first **15b** and second **15a** end, whereby the fibers are bundled, fused, and tapered proximate the first end **15b**, and providing a facet normal to the length of the fibers, formed by means of cutting, polishing, or any similar method (column 4 lines 67-68 and column 5 lines 1-3, column 5 lines 8-16, Figure 3), and wherein the second end **15a** of the fibers are detached from each other (column 4 lines 46-51, Figure 3).

With regards to the process limitations in claim 1 reciting that the facet is "formed by cleaving or cut (cutting) and polishing said tapered region in a direction perpendicular to the fiber axis" are not given patentable weight, as the method of forming a device is not germane to the issue of patentability of the device itself. An apparatus must be distinguished from the prior art in terms of structure, rather than the method by which the apparatus is formed. Therefore, in the case of claim 1, prior art that shows a facet

that is perpendicular to the fiber axis sufficiently shows such a structure is anticipated by the prior art.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 20, 23, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harootian (US Patent 5303373).

Addressing claim 20, Harootian discloses a plurality of optical fibers, each having a first and second end, whereby the fibers are bundled, fused, and tapered along their length, and providing a facet normal to the length of the fibers (column 2 lines 27-37), formed by means of cutting, polishing, or any similar method (column 5 lines 41-43). Harootian discloses the fibers used within the bundle are chosen to meet the requirements desired, and therefore would include the use of single mode optical fibers (column 4 lines 4-8). One of ordinary skill in the art would be motivated to use such fibers when it is desired to transmit signals in a single mode only. Also, Harootian teaches the claimed device of where all individual optical fibers fit precisely from one side of the corresponding imaging device to the other side of the bundle (column 3 lines 3-11, 28-33). As well, Harootian shows the device, wherein the diameter of the optical input at the fused end of the given optical fiber is smaller than the diameter of the same optical input at the unfused end of the given optical fiber (column 3 lines 34-43; column 2 lines 22-26). In addition, Harootian explains this device is designed to couple two imaging devices, the nature of which is uncritical (column 4 lines 17-24; figure 1). This being said, either end of the device as described by Harootian may be considered an optical input, and therefore, one can also say that the diameter of the optical input

proximate the fused end of the given optical fiber (as the entire bundle is fused) is larger than the diameter of the same optical input at the opposite end of the given optical fiber (column 3 lines 34-43; column 2 lines 22-26). As the nature of the devices coupled by Harootian is uncritical, and either end can serve as the optical input, it would have been obvious to one of ordinary skill in the art to allow the facet to receive an optical input, as this allows for the multiplication of signals, as each output (unfused fiber ends) will output the signal introduced to the fused end.

As to claim 23, Harootian shows the device of claim 20 wherein the core diameter of each optical fiber in the tapered region is smaller than the core diameter of each optical fiber in the non-tapered region (column 2 lines 27-37).

As to claim 26, Harootian teaches the device of claim 20 wherein at least one optical fiber has a different core size from at least one other optical fiber (column 4 lines 8-16).

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harootian (US Patent 5303373) and in further view of Basavanhally et al (US Patent 6827500).

Pertaining to claim 21, Harootian describes the device as discussed above. Harootian, however, does not disclose the use of array chosen from the group pf hexagonal arrays, square arrays, and three-nearest neighbor arrays. Basavanhally et al teaches a plurality of optical fibers that are arranged in a hexagonal close packed array (figure 1; column 2 lines 11-15). The use of the teachings of Basavanhally et al with the

device described above by Harootian would have been obvious to a person of ordinary skill in the art, as the hexagonal array described by Basavanhally et al minimizes unused space within the optical fiber bundle.

Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harootian (US Patent 5303373) and further in view of Smith et al (US Patent 5045100).

As to claim 22, Harootian describes the device as discussed above. However, Harootian does not disclose the use of a glass matrix to contain the fibers. Smith et al discloses the use of a glass matrix for arrangement of optical fibers within a bundle (column 2 lines 51-55; column 1 lines 35-51). To one of ordinary skill in the art, it would have been obvious to couple the teachings of Harootian and Smith et al, for the purpose of uniformity. The use of a glass matrix is beneficial as it provides material continuity between all elements of the optical fiber bundle, ensuring the optical fibers will behave in an appropriate manner. Using dissimilar materials in the construction of the fiber bundle increase the possibility of structural instability and behavior malfunction during the fusing, tapering, and stretching process. Since glass is a common material in fiber construction, it would have been obvious to one skilled in the art to use glass as the material for matrix construction for the reason stated.

Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harootian (US Patent 5,303,373) in view of Smith et al (US Patent 5,045,100) and further in view of Anthon et al (US Patent 6,411,762).

Speaking to claim 24, Harootian and Smith et al describe the device as discussed above. However, neither Harootian nor Smith et al discuss the use of fluorosilicate in the glass matrix designed to restrain fibers. Anthon et al discloses the use of a fluorosilicate glass matrix in the formation of optical fiber bundles (column 13 lines 1-16; figure A). Fluorosilicate offers a low refractive index doping agent, minimizing any light that may be passed from one optical fiber within the bundle to another. For this reason, it would have been obvious to one skilled in the art to use fluorosilicate as the specific glass matrix material.

Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Harootian (US 5303373) in further view of Au-Yeung et al (US 6134362).

As to claim 25, Harootian shows said device where the fibers comprising the fused section are uniformly stretched (column 2 lines 38-56; column 6 lines 50-58). However, Harootian does not disclose the method of uniformly stretching the bundle of fibers to obtain the desired amount of optical coupling between the cores of the fibers within the bundle. Au-Yeung et al discloses it is well known that various amounts of stretching during the fusing process lead to various amounts of coupling between the cores of the fibers within the bundle (column 1 lines 21-32, column 3 lines 50-52, Figure 3B). It would have been obvious to one of ordinary skill in the art to combine the teachings of Harootian and Au-Yeung et al, as it would allow the device of Harootian to be modified to achieve the desired amount of coupling by uniformly stretching the fused portion of the bundle by an amount denoted by Au-Yeung et al, thereby allowing for

greater specialization of the bundle, and more accurate formation of the bundle's coupling ratio (column 2 lines 6-16).

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Russell et al (US 4932747) in further view of Jain et al (US 6515257).

As to claim 27, Russell et al teaches a plurality of optical fibers **15** (column 3 lines 63-67, Figure 3), each having a first **15b** and second **15a** end, whereby the fibers are bundled, fused, and tapered proximate the first end **15b**, and providing a facet normal to the length of the fibers, formed by means of cutting, polishing, or any similar method (column 4 lines 67-68 and column 5 lines 1-3, column 5 lines 8-16, Figure 3). UV grade fibers may be used as the fibers within the bundle (column 4 lines 6-18). While Russell does not disclose these UV grade fibers as single mode fibers, it is well known in the art that such fibers can serve as single mode fibers. Jain et al discloses the use of UV grade optical fibers that are single mode fibers (column 9 lines 21-24). It would have been obvious to one of ordinary skill to combine the teachings of Russell et al and Jain et al, thereby using single mode optical fibers in the device of Russell et al, as the use these fibers allow the device to be applicable to areas where it is desirable to transmit only a single mode.

Claims 4, 5, 9-11, 14, 19 and 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Russell et al (US 4932747) in further view of Au-Yeung et al (US 6134362).

As to claims 28-30, Russell et al teaches a plurality of optical fibers **15** (column 3 lines 63-67; Figure 3), each having a first **15b** and second **15a** end, whereby the fibers are bundled, fused, and tapered proximate the first end **15b**, and providing a facet normal to the length of the fibers, formed by means of cutting, polishing, or any similar method (column 4 lines 67-68, column 5 lines 1-3, column 5 lines 8-16, Figure 3). However, while Russell et al discloses the bundle is stretched during the tapering process, it is not disclosed that this stretching will lead to a desired amount of coupling between the cores of the respective fibers within the bundle. Au-Yeung et al discloses a tapered fiber bundle that is fused and acts as a coupler (Figure 8, column 2 lines 19-54). Au-Yeung et al discloses it is well known that various amounts of stretching during the fusing process lead to various amounts of coupling between the cores of the fibers within the bundle (column 1 lines 21-32, column 3 lines 50-52, Figure 3B). It would have been obvious to one of ordinary skill in the art to combine the teachings of Russell et al and Au-Yeung et al, as it would allow the design process of Russell et al to be modified to achieve the desired amount of coupling by stretching the fused portion of the bundle by an amount denoted by Au-Yeung et al, thereby allowing for greater specialization of the bundle, and more accurate formation of the bundle's coupling ratio (column 2 lines 6-16).

As to claims 9 and 11, Russell et al teaches a method of coupling light using a plurality of optical fibers **15**, each having a first **15b** and second **15a** end (column 5 lines 19-30, Figures 3 and 4), wherein the fibers are fused together proximate the first end **15b** and tapered such that the core fiber diameters at the tapered end **15b** of the bundle

are smaller than core fiber diameters at the untapered **15a** end of the bundle (column 5 lines 30-36, Figures 3 and 4). In addition, Russell et al shows a facet formed by cleaving the fiber in any desired manner (column 5 lines 34-42, Figures 3 and 4), as well as illuminating the facet with light (column 5 lines 22-26). In addition, the second ends **15a** of the fibers **15** are left detached, or independent, from one another during the fusing process (column 4 lines 46-51, Figure 3). However, Russell et al does not disclose the method of uniformly stretching the bundle of fibers to obtain the desired amount of optical coupling between the cores of the fibers within the bundle. Au-Yeung et al discloses it is well known that various amounts of stretching during the fusing process lead to various amounts of coupling between the cores of the fibers within the bundle (column 1 lines 21-32, column 3 lines 50-52, Figure 3B). It would have been obvious to one of ordinary skill in the art to combine the teachings of Russell et al and Au-Yeung et al, as it would allow the design process of Russell et al to be modified to achieve the desired amount of coupling by uniformly stretching the fused portion of the bundle by an amount denoted by Au-Yeung et al, thereby allowing for greater specialization of the bundle, and more accurate formation of the bundle's coupling ratio (column 2 lines 6-16).

As to claims 4, 5, 10, 14, and 19, Russell et al and Au-Yeung et al disclose the device as described above. Furthermore, Figure 3 of Russell et al clearly illustrates the core diameter of each optical fiber in the tapered region **15b** is smaller than the core diameter of each optical fiber in the non-tapered region **15a**. Russell et al also teaches each optical fiber **15** is adapted to receive input signals adjacent the second end **15'**

and emit the signals as a combined output at the facet adjacent the second end of the fiber **15"** (column 7 lines 12-17, Figure 5). Moreover, Russell et al teaches at least one optical fiber has a different core size from at least one other optical fiber (column 4 lines 21-25).

Claims 2 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Russell et al (US Patent 4932747) in further view of Au-Yeung et al (US 6134362), and further in view of Basavanhally et al (US Patent 6827500).

Pertaining to claims 2 and 13, Russell et al and Au-Yeung et al teach the device and method as described above. While Russell et al suggests using any desired array shape (column 2 lines 43-51), it is not directly suggested (nor in Au-Yeung et al) that hexagonal, square, and three-nearest neighbor packed arrays can be used. Basavanhally et al teaches a plurality of optical fibers that are arranged in a hexagonal close packed array (figure 1; column 2 lines 11-15). The use of the teachings of Basavanhally et al with the device described above by Russell et al would have been obvious to a person of ordinary skill in the art, as the hexagonal array described by Basavanhally et al minimizes unused space within the optical fiber bundle. While it is observed Russell et al describes the fiber bundle as being closely packed in any desired array., this does not exclude the application of the teachings of Basavanhally et al to the device of Russell et al. Certainly the overall teaching supplied by Basavanhally et al shows the formation of arrays showing a hexagonal shape, and while the actual scaled device of Russell et al may not couple directly with the actual scaled array of

Basavanhally et al, the teachings remain applicable, namely because they show that it is possible to use arrays of various geometries for optical fiber bundles.

Claims 3 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Russell et al (US Patent 4932747) in further view of Au-Yeung et al (US 6134362), and in further view of Smith et al (US 5045100).

Regarding claims 3 and 12, Russell et al and Au-Yeung et al teach the device and method as described above. In addition, Russell et al discloses the use of an optical array of a predetermined format (column 2 lines 45-51). However, Russell et al and Au-Yeung et al do not disclose the specific use of a glass matrix to contain the optical fibers of the device. Smith et al discloses the use of a glass matrix for arrangement of optical fibers within a bundle (column 2 lines 51-55, column 1 lines 35-51). To one of ordinary skill in the art, it would have been obvious to couple the teachings of Russell et al and Smith et al, for the purpose of uniformity. The use of a glass matrix is beneficial as it provides material continuity between all elements of the optical fiber bundle, ensuring the optical fibers will behave in an appropriate manner. Using dissimilar materials in the construction of the fiber bundle increase the possibility of structural instability and behavior malfunction during the fusing, tapering, and stretching process. Since glass is a common material in fiber construction, it would be obvious to one skilled in the art to use glass as the material for matrix construction for the reason stated.

Claims 7 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Russell et al (US Patent 4932747) in further view of Au-Yeung et al (US 6134362), in view of Smith et al (US 5045100) and further in view of Anthon et al (US 6411762).

Speaking to claims 7 and 16, Russell et al discloses the device and method, as further viewed by Au-Yeung et al and Smith et al, as discussed above. Neither Russell et al, nor Au-Yeung et al, nor Smith et al discloses the use of a glass matrix comprised of fluorosilicate. Anthon et al discloses the use of a fluorosilicate glass matrix in the formation of optical fiber bundles (column 13 lines 1-16, Figure A). Fluorosilicate offers a low refractive index doping agent, minimizing any light that may be passed from one optical fiber within the bundle to another. For this reason, it would have been obvious to one skilled in the art to use fluorosilicate as the specific glass matrix material.

Claims 6, 8, 15, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Russell et al (US Patent 4932747) in further view of Au-Yeung et al (US 6134362), and in further view of Harootian (US 5303373).

As to claims 6, 8, 15 and 17, Russell et al and Au-Yeung et al disclose the device and method as described above. Furthermore, Russell et al discloses the diameter of the optical input at the unfused end **15a** of the given optical fiber is larger than the diameter of the same optical input at the fused end **15b** of the given optical fiber, due to the tapering process. Also note that Russell et al specifically states that the device may be fashioned into a number of sizes and shapes, and would include the arrangement where the optical input at the unfused end of the given optical fiber is larger than the

diameter of the same optical input at the fused end of the given optical fiber (column 5 lines 8-16, Figure 3). However, Russell et al and Au-Yeung et al do not disclose multi-directional qualities of the device, meaning that it is able to receive an input at the facet and be emitted as a plurality of signals from the unfused ends of the fibers. Harootian shows a multiple fiber bundle which is tapered along its length and cleaved proximate the fused end, where the ends are coupled to two imaging devices, the nature of which is uncritical (column 4 lines 17-24; figure 1). Therefore it is possible that an input is delivered to the facet of the fused portion of the bundle and distributed to each optical fiber within the bundle. It would have been obvious to one of ordinary skill in the art to combine the teachings of Harootian and Russell et al to extract the teaching that tapered optical fiber bundles may be adapted to allow the facet to accept input signals and thereby adapt the opposite, untapered end to act as an output for optical signals.

Response to Arguments

Applicant's arguments filed 4/10/2006 have been fully considered but they are not persuasive.

Applicant argues, with respect to claim 1 and in response to the statement by the Examiner that "Russell shows ends that are detachable from one another," that teaching ends that are detachable from one another does not teach ends that are "detached from each other," and therefore the current invention is distinguished over the prior art. The Examiner disagrees.

"Detachable" is commonly defined as "designed to be unfastened or disconnected without damage"; whereas "detached" is commonly defined as "separated

or unfastened." Therefore, in commenting the fiber ends of Russell are detachable for one another, it is obvious that Russell therefore covers ends that are both detached and capable of being detached. Therefore, clearly Russell discloses fiber ends that are detached from each other.

Applicant argues, with respect to claim 1 and also pertaining to the previous paragraph, that the Examiner has "failed to show why one skilled in the art would have been motivated to detach the allegedly detachable input ends of Russell." Applicants further asserts that "one skilled in the art is taught away from detaching the individual input ends of Russell from each other, since this would prevent the Apparatus from operating as disclosed in Russell." The Applicant further asserts this causes the current invention to be patentable over Russell. The Examiner disagrees.

It is the opinion of the Examiner that the Applicant is extracting meaning from claim 1 which is not explicitly stated. Claim 1 requires "the second end of the fibers are detached from each other." This is clearly met by Russell as Russell shows fibers ends that are described as "individual fibers" (see Russell col. 4 lines 46-51). The Applicant seems to believe that these individual fiber ends are not detached from one another, as they are closely packed in a bundle. While these individual fibers are closely packed within a bundle, <u>the fact that they are unfused</u>, as opposed to the first end (**15"**, Fig 5 of Russell) which are fused, <u>makes them detached from one another</u>, as required by claim 1. The second ends of Russell are detached from one another, as they are separated into individual fibers. Detached fibers do not require the fibers to be "free floating," it simply requires the fibers to be separate from one another, which the fiber ends of

Russell are; therefore fibers within a packed array can still be considered "detached" if the fibers within the array are capable of transmitting their own signal without the aid of the other fibers, or in other words, are unfused.

Applicant argues, with respect to claim 20, that Harootian teaches away from the use of single fibers since Harootian states there is "no criticality to the overall dimensions of the [...] individual optical fibers used (col 4 lines 8-10 of Harootian)." Applicant asserts this statement of Harootian "teaches one skilled in the art to use multimode fibers, since multimode fibers are fibers for which the overall dimensions are not critical, whereas dimensions are critical in single mode fibers." The Examiner disagrees.

Typical optical core sizes are approximately 8-10 microns for a single mode fiber and at least 50 microns for multimode fibers. For this reason, it is clear that in the above statement of Harootian, the reference is referring to the available optical core sizes of fibers that are suitable for the invention of Harootian. Therefore, by the range given alone, Harootian includes both single mode and multimode fibers. Furthermore, the statement above states that the fiber size is of no critically to the workability of the invention of Harootian, and does not state that the size of the fiber is not important to the workability of the fiber. There is a clear and distant difference between these two statements: the applicant asserts a fiber in which size does not affect performance is suitable for the invention, while the reference is teaching the device will work well with any fiber which suits the designer's needs and size does not need to be a determining factor in the fiber choice. The full citation by Harootian reads, "There is no critically to

the overall dimensions of the fiber bundles utilized or of the individual optical fibers used. These will be chosen fully conventionally (col 4 lines 8-10)." For these reasons, the Examiner maintains that Harootian suggests the use of single mode fibers, as well as multimode fibers.

Applicant argues, with respect to claim 20, that one skilled in the art would have readily understood that using single mode fibers in the device of Harootian would have introduced coupling between neighboring pixels, thus adversely affecting the operation of the device. Therefore Applicant asserts Harootian teaches away from the use of single mode fibers by teaching the fibers are tapered in a manner that does not create significant coupling between the fibers of the invention.

In response to applicant's argument that Harootian teaches away from the use of single mode fibers (because of the reason given above), the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references *would have suggested to those of ordinary skill in the art.* See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). While coupling between cores of single mode fibers which are fused and tapered within a bundle may occur, the coupling ratio between cores is dependent upon the length and diameter of the waist of the taper (Kawasaki et al "Bi-conical-taper single-mode fiber coupler" col 2 lines 11-19). In this case, although Harootian does not encourage coupling between the cores of the fibers within the bundle, this does not teach away from the use of single mode fibers, as

the coupling ratio can be controlled in the tapering process. In fact, this coincides with the teaching of Harootian, where it is taught that the fibers are *tapered in a manner so as not to create a significant coupling ratio*; In comparison, the Applicant asserts *fibers which do not experience a significant coupling* must be used in the device. Regardless, the above size range given by Harootian for optical fibers suitable for the device clearly include single mode fibers. This range *would have <u>suggested</u> to one of skill in the art* that single mode fibers are suitable for use in the device of Harootian.

Applicant argues, with respect to claims 23 and 26, that these claims are patentable over Harootian, due to their dependency upon claim 20 and for the reasons cited above. The Examiner disagrees for the reasons cited above.

Applicant argues, concerning claim 21, that the use of the teachings of Basavanhally with the device of Harootian would have not been obvious. The Examiner has previously stated this would be obvious, as the hexagonal array of Basavanhally minimizes unused space within the optical fiber bundle. The Applicant disagrees, as "Figures 2(a) and 2(b) of Harootian show non-hexagonal arrays where no space is lost within the optical fiber bundle, and furthermore submit the Examiner "has failed to show how a hexagonal array could minimize the unused space of Harootian, in particular view of the fact that there seems to be no such unused space in Harootian." The Examiner disagrees with the Applicant's assertions.

Figures 2(a) and 2(b) of Harootian show a view of the fiber before (Fig 2a) and after (Fig 2b) the fiber bundle is compressed (Harootian; col 4 lines 34-47). Therefore, in Fig 2a, there is certainly unused space, as the bundle can experience further

compression (shown in Fig 2b). However, even in Figure 2(b) after compression, one can see that space is still being unused, as the dark areas represent space between the optical fiber cores (portion which will output a light signal). Since Harootian compresses the fiber bundle, it can be clearly seen that Harootian wishes to minimize unused space in the fiber bundle. Therefore Harootian does suggest minimization of unused space is desirable for the device. Basavanhally et al states fiber bundles of the prior art do not provide precise alignment and spacing of fibers at the exit of the bundle (Basavanhally; col 1 lines 41-47). In addition, Basavanhally et al further teaches the hexagonal array will minimize unused space at the end of the fiber bundle (Basavanhally; col 2 lines 10-39). For these reasons, Harootian does exhibit unused space that can be minimized with the hexagonal array of Basavanhally, and therefore the teachings of Basavanhally with the device of Harootian would have been obvious.

Applicant argues, with respect to claim 21, that the Examiner has failed to show that one skilled in the art would be motivated to give the apparatus of Harootian that shape disclosed in Basavanhally to modify the imaging device to have a hexagonal input or output. Further, Applicant asserts there is no problem of Harootian that one of skill would be motivated to change with the teachings of Basavanhally. The Examiner disagrees.

Overcoming unused space is a goal of Harootian, as explained above, and Basavanhally discloses a manner in which to use a modified shape in order to minimize space. These reasons are enough alone to suggest to one of ordinary skill in the art that the teachings of Basavanhally, when applied to Harootian, are advantageous.

Moreover, there are additional reasons why one may wish to apply the teachings of Basavanhally to the device of Harootian, such as the following: 1) this allows the device of Harootian to take on a new input or output shape, thereby allowing the device to couple with another device with a similar shaped output or input, 2) this allows one to increase the magnification and demagnification characteristics of the Basavanhally device, as the input or output can be decreased in size, and 3) this allows one to create an output which differs in shape from the input signal, which may be desired for various applications. The Examiner reminds the Applicant that device modifications are not made only in the case of a problem with the current device, but also to simply improve upon the positive performance of the current device. For all of the above reasons, it is the ~~option~~ opinion of the Examiner that one of skill in the art would be motivated to combine the teachings of Basavanhally to the device teachings of Harootian.

Applicant argues, pertaining to claims 22 and 24, that the Examiner has failed to show that either Smith (in the case of claim 22) or Anthon (in the case of claim 24) discloses using single mode optical fibers. Therefore, Applicant asserts claims 22 and 24 are patentable over either Harootian in view of Smith (in the case of claim 22, or a combination of Harootian, Smith and Anthon (in the case of claim 24). The Examiner disagrees.

As discussed above, the optical fiber size range suggested by Harootian is sufficient in establishing it would have been obvious to one of skill in the art to utilize single mode fibers. Therefore, neither Smith nor Anthon are required to include the use of single mode fibers.

Applicant asserts, concerning claim 25, that one skilled in the art would have lacked motivation to modify the apparatus of Harootian to have fibers coupled as in Au-Yeung, because such coupling between the fibers "would have impaired the operation of the apparatus by introducing undesirable noise in the pixel information transferred by the apparatus." The Examiner disagrees.

In response to applicant's argument that one skilled in the art would have lacked motivation to modify the apparatus of Harootian to have fibers coupled as in Au-Yeung, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have *suggested* to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). Harootian teaches the taper is formed so as to minimize unacceptable distortions (Harootian; col 3 lines 51-67). Moreover, the Applicant has stated that Harootian teaches to minimize coupling between fibers of the bundle (see above). Therefore, clearly Harootian is concerned with the amount of coupling between fibers in the bundle, and therefore the teaching of Au-Yeung is advantageous, as it allows for a tapering technique which gives the designer a greater control over the fibers' coupling ratio with one another. The Examiner wishes to draw the Applicant's attention to Figures 3B and 6 of Au-Yeung which shows the method is not restricted to only allow for high coupling ratios, but for any desired ratio. As previously stated, it would have been obvious to one of ordinary skill in the art to combine the teachings of Harootian and Au-Yeung et al, as

it would allow the device of Harootian to be modified to achieve the desired amount of coupling by uniformly stretching the fused portion of the bundle by an amount denoted by Au-Yeung et al, thereby allowing for greater specialization of the bundle, and more accurate formation of the bundle's coupling ratio (Au-Yeung; col 2 lines 6-16).

Applicant asserts, concerning claim 25, that "Au-Yeung does not teach that it is possible to achieve simultaneously a desired coupling and a required size and shape." In view of this Applicant asserts Au-Yeung cannot be combined with Harootian, as Harootian requires the ends of the fiber bundle to precisely fit the coupling device to which it is coupled. The Examiner disagrees.

As stated above with respect to claim 25, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have *suggested* to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). Furthermore, claim 25 only requires uniform stretching to provide desired coupling, and does not require a precise shape to be formed. Therefore, the Examiner maintains that claim 25 is not patentable over Harootian in view of Au-Yeung.

Applicant asserts, with reference to claim 27, that claim 27 is patentable over the combination of Russell in view of Jain because Russell (whose goal it is to homogenize the intensity profile of an excimer laser) teaches an excimer laser that is multimode in nature and allowing it only to transmit in single mode (with the use of a single mode

fiber) would make the device transfer less power and go against the object of Russell to reduce losses. The Examiner disagrees.

The Examiner recognizes the laser of Russell is multimode in nature, and therefore transmits signals in two or more transverse or longitudinal modes. The Examiner also recognizes that the goal of Russell is to homogenize the intensity profile of an excimer laser. The common meaning of homogenization in the optical arts is the manipulation of several signals so that they are the same in their optical properties. Therefore, the use of single mode fiber would homogenize the output of an excimer laser, as it would restrict propagation of the signal to a single mode. Regardless, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In the instant case, the teachings of Russell, in view of Jain, show that the device of Russell uses UV fibers and Jain uses a UV single mode fiber, thereby suggesting that single mode fibers are suitable for Russell. In addition, construction of the device of Russell with single mode fibers allows the device to be applicable in situations where it had not previously been applicable, such as where a lower power excimer laser is required, as the Applicant has admitted.

Applicant argues, in relation to claim 28, that Russell does not mention stretching optical fibers. The Examiner disagrees.

Russell discloses the optical fibers are tapered while the fibers are in plastic form (Russell; col 5 lines 8-14). Stretching takes place while the fibers are drawn during the tapering process. This is a common practice for tapering within the art.

Applicant argues, with respect to claim 28, that one skilled in the art would not be motivated to use the fibers of Au-Yeung with the device of Russell as this would have increases the cladding to core diameter ratio thereby increasing the power losses in the apparatus of Russell. Further, Applicant asserts that one skilled in the art would not be motivated to use the fibers of Au-Yeung as Russell teaches tapering the fiber ends to a required size and shape, whereas Au-Yeung does not show how fibers can be shaped as desired while stretching.

As previously addressed, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In the present case, Au-Yeung et al discloses it is well known that various amounts of stretching during the fusing process lead to various amounts of coupling between the cores of the fibers within the bundle (Au-Yeung; column 1 lines 21-32, column 3 lines 50-52, Figure 3B). It would have been obvious to one of ordinary skill in the art to combine the teachings of Russell et al and Au-Yeung et al, as it would allow the design process of Russell et al to be modified to achieve the desired amount of coupling by stretching the fused portion of the bundle by an amount

denoted by Au-Yeung et al, thereby allowing for greater specialization of the bundle, and more accurate formation of the bundle's coupling ratio (Au-Yeung; column 2 lines 6-16). Furthermore, claim 28 only requires stretching to provide desired coupling, and does not require a precise shape to be formed. Therefore, the Examiner maintains that claim 28 is not patentable over Russell in view of Au-Yeung.

Applicant asserts that claims 4-5, 9-11, 14, 19, 29, and 30 are patentable over Russell in view of Au-Yeung for the reasons cited above with regard to claim 28. The Examiner disagrees for the reasons cited above.

Applicant asserts, with regard to claims 2 and 13 (rejected over the combined teachings of Russell, Au-Yeung, and Basavanhally), that the Examiner has failed to show that Basavanhally discloses stretching a plurality of optical fibers to provide a desired amount of coupling between each optical fiber, and therefore asserts that claims 2 and 13 are patentable over the combined teachings of Russell, Au-Yeung, and Basavanhally. The Examiner disagrees.

The Examiner reminds the Applicant that it is Au-Yeung that discloses the above teaching in question (underlined). Therefore, Basavanhally is not required to disclose the above teaching in question. The Examiner maintains the rejection of claims 2 and 13 in view of the teachings of Russell, Au-Yeung, and Basavanhally.

Applicant asserts, with regard to claims 3 and 12 (rejected over the combined teachings of Russell, Au-Yeung, and Smith), that the Examiner has failed to show that Smith discloses stretching a plurality of optical fibers to provide a desired amount of coupling between each optical fiber, and therefore asserts that claims 2 and 13 are

patentable over the combined teachings of Russell, Au-Yeung, and Smith. The Examiner disagrees.

The Examiner reminds the Applicant that it is Au-Yeung that discloses the above teaching in question (underlined). Therefore, Smith is not required to disclose the above teaching in question. The Examiner maintains the rejection of claims 3 and 12 in view of the teachings of Russell, Au-Yeung, and Smith.

Applicant asserts, with regard to claims 7 and 16 (rejected over the combined teachings of Russell, Au-Yeung, Smith and Anthon), that the Examiner has failed to show that Anthon discloses <u>stretching a plurality of optical fibers to provide a desired amount of coupling between each optical fiber</u>, and therefore asserts that claims 2 and 13 are patentable over the combined teachings of Russell, Au-Yeung, Smith and Anthon. The Examiner disagrees.

The Examiner reminds the Applicant that it is Au-Yeung that discloses the above teaching in question (underlined). Therefore, Anthon is not required to disclose the above teaching in question. The Examiner maintains the rejection of claims 7 and 16 in view of the teachings of Russell, Au-Yeung, Smith and Anthon.

Applicant asserts, with regard to claims 6, 8, 15, and 17 (rejected over the combined teachings of Russell, Au-Yeung, and Harootian), that the Examiner has failed to show that Harootian discloses <u>stretching a plurality of optical fibers to provide a desired amount of coupling between each optical fiber</u>, and therefore asserts that claims 2 and 13 are patentable over the combined teachings of Russell, Au-Yeung, and Harootian. The Examiner disagrees.

The Examiner reminds the Applicant that it is Au-Yeung that discloses the above teaching in question (underlined). Therefore, Basavanhally is not required to disclose the above teaching in question. The Examiner maintains the rejection of claims 6, 8, 15, and 17 in view of the teachings of Russell, Au-Yeung, and Harootian.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rhonda S. Peace whose telephone number is (571) 272-8580. The examiner can normally be reached on M-F (8-5).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (571) 272- 2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Rhonda S. Peace
Examiner
Art Unit 2874

John D. Lee
Primary Examiner